Liquidity Provision and Collateral Haircuts in Payments Systems

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- *Central banks play a pivotal role in well-functioning payments systems by providing liquidity via collateralized lending.*
- *Collateral haircuts limit the exposure of the central bank's balance sheet to credit, market and liquidity risk, and have potential policy implications because of their influence on financial market participants and on the relative liquidity of financial assets.*
- *Central banks must consider how their haircut policies affect the market's asset allocation, the relative price and liquidity of assets, and the likelihood of participants to default.*
- *Under extraordinary circumstances, there is a rationale for the central bank to temporarily reduce haircuts or broaden the list of eligible collateral to mitigate the shortage of liquidity in the market.*

To maintain monetary and financial stability, central banks may need to provide liquidity to financial institutions, financial markets and financial market infrastructure.[1] This includes the extension of intraday and overnight loans to promote a safe and efficient payments system. When extending these loans, the central bank typically requires collateral (assets pledged as security) to protect its balance sheet against the risk of default by the borrower (credit risk).[2] In addition, the central bank also applies a discount (haircut) to the market value of the instruments pledged, as protection against a decline in the value of the collateral (market risk) and a decline in the asset's marketability (liquidity risk).[3] Given the pivotal role of the central bank in the financial system, the design of its collateral policy is important. In particular, what should the size of haircuts be and how should that size vary under different financial system conditions?

Haircuts are typically chosen to protect lenders in the event of a borrower's default

This article examines how haircuts on collateral pledged to the central bank are determined. Haircuts are typically chosen to protect lenders against market and liquidity risk in the event of a borrower's

1 Financial market infrastructure includes exchanges, central counterparties, and payment and settlement systems. Under the Payment Clearing and Settlement Act, the Bank of Canada is responsible for the regulatory oversight of clearing and settlement systems with a view to controlling systemic risk.

2 A list of eligible securities and margin requirements for the Bank of Canada's Standing Liquidity Facility as of 7 September 2010 is available at <http://www.bankofcanada.ca/wp-content/uploads/2011/08/securities_160710.pdf>.

3 Note, however, that a central bank is better able to absorb liquidity risk than private agents, owing to its ability to create liquidity.

default. Recent research argues that the central bank should also consider the impact of its haircut policy on the risk-management incentives and asset-portfolio decisions of its counterparties and on the relative market liquidity of securities.[4, 5] These effects arise from the central bank's unique ability to create liquid settlement assets and because it is a major participant in the financial system, owing to the size of its balance sheet and the fact that it can undertake much larger market interventions than private sector institutions.

The article begins with a discussion of the central bank's role in providing liquidity in payments systems, as well as the role of collateral and haircuts in central bank lending. Particular institutional details are provided for the Canadian context. The next section focuses on the distinguishing features of a central bank's haircut policy relative to private sector practices. This is followed by a review of recent research on the determination of the optimal level of haircuts, using a model that explicitly incorporates the central bank's unique position in the payments system. The article concludes with an examination of the implications of this research for central bank haircut policy.

Liquidity Provision in Payments Systems

Financial institutions send payments to each other continuously throughout the day on their own behalf and on behalf of their clients. These payment flows arise from the underlying economic activities of payments-system participants and their clients. Although particular arrangements and institutional details differ from country to country and from system to system, central banks generally play an important role in the provision of liquidity to these payments systems and in their oversight. Central banks typically require collateral and face a fundamental trade-off between risk and liquidity when setting their haircut policies.

The Large Value Transfer System (LVTS) is the main settlement system in Canada. It is used to complete large-value, time-critical payments arising from the day-to-day business activities of households, corporations and financial institutions, and to settle Canadian-dollar obligations arising from securities and foreign exchange transactions.[6]

The Bank of Canada plays a central role in the day-to-day operation and oversight of the LVTS. Participants in the system use claims on the Bank (reserve accounts at the Bank of Canada) to settle their net payment obligations with other direct participants. The Bank also supplies liquidity to the system via collateralized intraday and overnight loans to LVTS participants (see **Box**). The Bank is also responsible for overseeing the operation and risk controls of the LVTS, given the LVTS's designation as a systemically important system.

Intraday finality and the Bank of Canada's residual guarantee

The LVTS processes payments in real time, and settlement of the system occurs on a multilateral net basis at the end of the day. During the day, processed payments are final and irrevocable. This immediate intraday finality is achieved because the Bank of Canada explicitly guarantees that settlement will occur, even in the event of multiple defaults.[7] This is facilitated through the use of collateral to secure participants' intraday net debit (negative) positions and by a residual guarantee provided by the Bank.

The Bank of Canada explicitly guarantees that settlement will occur, even in the event of multiple defaults

Since payments are not fully funded by senders' settlement balances or fully collateralized by the senders' and/or recipients' collateral holdings, this central bank guarantee of intraday finality provides an implicit intraday credit to system participants.

4 The idea that collateral policy can play an important role in influencing the development of financial markets has been known for some time. It has influenced Bank of Canada actions to promote the development of Canadian financial markets since the 1950s and has underpinned technical advice provided by the International Monetary Fund and the World Bank, among others, for many years.

5 Market liquidity refers to the ability to quickly sell an asset without causing a significant movement in its price.

6 Arjani and McVanel (2006) provide an overview of the structure of the LVTS and its relationship to the Canadian financial system. The LVTS is owned and operated by the Canadian Payments Association and is overseen by the Bank of Canada. See also the information contained in the backgrounder on the LVTS at <http://www.bankofcanada.ca/about/backgrounders/large-value-transfer-system-lvts/>.

7 If multiple participants default and if the collateral assigned to the system is insufficient to cover the total value of their obligations, the Bank of Canada would take possession of the available collateral and become an unsecured creditor of the defaulting institutions for the amount remaining after the collateral has been sold.

Collateral Requirements Under Tranche 1 and Tranche 2 of the LVTS

The Large Value Transfer System (LVTS) is a real-time, electronic wire transfer system that processes large-value, time-critical payments quickly and continuously throughout the day. It assures participants and their customers that, once a payment message has passed the system's risk-control tests, the transaction is settled on the books of the Bank of Canada on the same day, regardless of what happens to any of the participants afterward.

The sender of an LVTS payment can choose between two payment streams: Tranche 1 and Tranche 2. Each tranche has a corresponding risk-control limit.

A participant can send a Tranche 1 payment as long as the net amount that it owes (the balance of all its Tranche 1 payments sent and received) is less than the collateral that it has pledged to the Bank of Canada for Tranche 1 activity. Should the participant default during the course of that day, this collateral would be used to cover any net negative position in this payment stream. For this reason, Tranche 1 payments are known as "defaulter-pays."

Under Tranche 2, each participating institution begins the day by granting a bilateral credit limit (BCL) (which can be zero) to every other participating institution—the largest net exposure that it is prepared to accept from another participant on that day. These BCLs limit the negative position that each participant can take vis-à-vis other participants. In addition, each participant (as a sender) has a multilateral net debit cap, calculated as the sum of all BCLs extended to it, multiplied by a specified system-wide percentage set by the Canadian Payments Association. This multilateral cap limits the exposure of each participant in relation to the whole system and therefore the potential magnitude of any default. Each participating financial institution pledges collateral to the Bank of Canada in an amount equal to the largest BCL that it has extended to any other institution, multiplied by the specified system-wide percentage. If a participating institution fails, its collateral is seized and used to meet its obligation. If the defaulter's collateral is insufficient, the loss-allocation procedures distribute any remaining obligation proportionally among survivors on the basis of the BCLs granted by survivors to the failed institution. The survivors' obligation is not unlimited: it will never be larger than the amount of collateral they have pledged to the Bank. The collateral pledged by system participants is always sufficient to cover the failure of the institution with the largest possible amount owing to the system, i.e., the institution with the largest net debit cap. Tranche 2 has been described as "survivors-pay," since surviving financial institutions may be called upon to absorb the losses associated with a failure (after the defaulter's collateral is seized and used to meet its obligations). In the event of multiple defaults, the same process is used: first the defaulters' collateral is used, then the survivors face a loss allocation. If an obligation remains, the Bank will contribute the funds to settle the system under its residual guarantee.

Tranche 2 payments make up the great majority of the volume and value of payment transfers in the LVTS, principally because of savings in collateral relative to Tranche 1 operations. Nevertheless, participants who want immediate real-time settlement equivalency prefer Tranche 1 payments, even though they come with higher collateral costs.

The Standing Liquidity Facility

The Bank also facilitates settlement of the LVTS by routinely extending overnight collateralized loans through the Standing Liquidity Facility (SLF) to direct LVTS participants that are experiencing temporary shortfalls in their settlement balances at the end of the day. These advances provide participants with access to a reliable source of liquidity should they need to fund their end-of-day payment obligations, thus helping them to transfer payments efficiently among themselves during the day.[8] The interest rate on the overnight loan is set at the upper limit of the Bank of Canada's operating band for the overnight interest rate (the Bank Rate).[9]

Collateral services

The Bank establishes eligibility criteria for the various asset types that can be pledged intraday to collateralize bilateral credit limits or overnight through the SLF. It provides the LVTS system operator, the Canadian Payments Association, with valuations of the securities that are pledged as collateral. The Bank values and monitors the collateral pledged by LVTS participants on an ongoing basis.

The Role of Collateral and Haircuts in Central Bank Lending

Why lend against collateral?

Lenders require the pledging of assets to secure a loan, primarily to protect themselves against the risk of default by the borrower. As a public institution, a central bank requires collateral to protect its balance sheet against such risk.[10]

While small financial losses would likely have minor consequences, the negative effect of a significant loss on the central bank's balance sheet could potentially affect its ability to achieve its monetary policy and financial stability objectives. It could also undermine public confidence in the central bank. Any central bank financial loss from defaulted loans will have a negative impact on the balance sheet of either the central bank or the government.[11] While the exact timing of the loss can be altered by short-term portfolio and debt management (e.g., central bank sterilization or public debt issuance), the loss must ultimately be absorbed by some form of costly taxation or asset sales and would therefore affect the financial health of the consolidated balance sheet of the government and the central bank and, accordingly, the economy.[12]

A significant loss on the central bank's balance sheet could potentially affect its ability to achieve its monetary policy and financial stability objectives

The central bank also requires collateral to support neutrality in the conduct of liquidity operations and to avoid having to differentiate the pricing of its lending in day-to-day operations based on the creditworthiness of the counterparties. Secured lending allows the central bank to lend at a single interest rate to a set of heterogeneous counterparties, which facilitates the communication and transmission of monetary policy.[13]

What is a haircut?

The amount of collateral required for a loan is determined by the haircut applied by the lender. The haircut "trims" the market value of the collateral by a certain percentage to determine the maximum loan amount. For example, when the haircut is 1 per cent, the borrower needs to post collateral (e.g., treasury bills) with a value of $100 with the central bank in order to acquire a loan of $99.

8 For more information on the function of the Bank of Canada as "lender of last resort," see <http://www.bankofcanada.ca/financial-system/lender-of-last-resort/>.

9 This provides LVTS participants with a pricing incentive to first look for other sources of funding. For further details, see the backgrounder on the Bank Rate at <http://www.bankofcanada.ca/about/backgrounders/bank-rate/>. For more information on the implementation of monetary policy in the LVTS environment, see the Bank's primer at <http://www.bankofcanada.ca/wp-content/uploads/2010/07/lvts_primer_2010.pdf>.

10 The Bank of Canada Act (<http://www.bankofcanada.ca/wp-content/uploads/2010/07/act_loi_boc_bdc.pdf>) requires the Bank to take collateral when making loans or providing advances.

11 The central bank can finance the loss by permanently expanding the monetary base (i.e., a seigniorage tax), limiting the flexibility needed to achieve price and financial stability. Alternatively, by decreasing remittances of earnings (or through capital injections from the government), the loss can be transferred to the government. The government would have to finance the loss by raising taxes or by cutting spending, hence, tightening its budget and potentially lowering economic welfare.

12 Johnson and Zelmer (2007) examine, in the context of central bank balance-sheet management under new accounting standards, how a negative capital position on the Bank's balance sheet might pose risks to the credibility of monetary policy and raise doubts about its ability to act as lender of last resort.

13 There are strict "membership criteria" for becoming a direct counterparty to the Bank of Canada, either as a direct LVTS participant or as a primary dealer.

Why use haircuts?

In the event that a borrower defaults, a haircut minimizes the lender's losses from the market and liquidity risks associated with the collateral pledged. A lender's key concerns are what the secondary price of the collateral would be when the lender needs to sell the collateral to reclaim the funds loaned and how long it would take to liquidate it. A haircut is therefore determined based on the price volatility and liquidity of the pledged collateral asset. More-volatile or less-liquid assets usually receive a higher haircut to protect the lender from a price decline or liquidation costs. In the case of a default where the price of the collateral drops so low that the haircut provides insufficient coverage, the lender will suffer a loss. Thus, when determining the size of a haircut, there is a trade-off: a lower haircut can relax the borrower's liquidity constraint, but it also increases the lender's potential loss.

A haircut also influences the behaviour of potential counterparties. A borrower facing a haircut is less inclined to default because the collateral posted with the lender is worth more than the loan amount it has received. Hence, the borrower is more likely to repay the loan and retrieve the collateral.

Central Bank vs. Private Sector Haircuts

The traditional risk-management approach used to determine haircuts is based on examining the historical volatility of the value of the collateral and setting a haircut to limit the lender's risk exposure, based on a given risk tolerance.[14] This approach is appropriate for a private sector lender that has little market power and wants to maximize expected return and minimize exposure to counterparty default.

The central bank's unique ability to create and supply an unlimited amount of settlement assets to the payments system ensures that it is never constrained in its provision of liquidity.[15] Nevertheless, any losses incurred will be shared by society and will likely generate costly economic distortions. The central bank must therefore balance access to liquidity with prudent risk management.

The central bank also plays a prominent role in the overnight money market and other core funding markets. The study presented in the following section argues that the central bank's haircut policy can therefore directly affect liquidity in these markets and indirectly influence market participants' choice of asset portfolios, as well as the pricing of credit and liquidity spreads. The central bank is concerned not only about its own exposure to credit risk, but also about the efficiency and stability of the financial system. Consequently, in setting its haircut policy, the central bank must consider the impact of the policy on the financial system and its participants.[16]

The central bank is concerned not only about its own exposure to credit risk, but also about the efficiency and stability of the financial system

A Model of Central Bank Haircuts

In a recent study, Chapman, Chiu and Molico (2011) develop a stylized model of the Canadian large-value payments system to examine the various effects that changes to central bank collateral haircuts can have on the economy.

The model economy

In the model, financial institutions (FIs) send and receive payments through a payments system on behalf of their clients. FIs are uncertain of the exact amount and timing of these payments and must therefore efficiently manage their liquidity based on a forecast of their payment needs. At the beginning of each day, FIs try to forecast their liquidity needs and to optimize their asset portfolios accordingly by trading with each other in a financial market. In the model, an FI can hold only two possible assets in its portfolio: a *liquid* asset, which has a lower rate of return but is (or can be easily exchanged for) the means of settling payment obligations; and an *illiquid* asset, which has a higher expected rate of return but is not generally accepted in the settlement of payment obligations, and has a more volatile price (is

14 See, for example, García and Gençay (2006) and the related risk-management literature cited.

15 Payments in the LVTS are settled via the account balances that participants hold at the Bank. Since the Bank of Canada can supply virtually unlimited amounts of these deposits and guarantees settlement even in the event of multiple defaults on a single day, sufficient balances will be available for settlement purposes under all circumstances.

16 As discussed in Zorn and García (2011), the collateral policy of central banks not only reflects the objective of protecting the central bank's balance sheet from financial losses arising from a counterparty default, but also supports the central bank's objectives for monetary policy and financial stability, including encouraging better risk-management practices by financial institutions.

riskier). This scenario highlights the trade-off between liquidity risk and asset return. When FIs foresee the need to send a high volume of payments, they will choose to hold a higher amount of the liquid asset than the illiquid asset to facilitate payment. If they expect to receive more payments than they send, they will choose to hold a lower amount of the liquid asset to earn a higher rate of return. Given the uncertain nature of the payment flows, however, and their realized payment needs, some banks may be holding too little of the liquid asset.

If FIs are unable to fund a shortage of the liquid asset through the intraday money market, then the central bank lending facility comes into play. In the study, the authors focus on this specific case. In this situation, there is credit risk because central bank loans are subject to potential default by the borrowers. To limit its financial exposure, the central bank requires borrowers to pledge their asset holdings as collateral. In the model, since the only FIs that require central bank funding are those that need to send payments but hold illiquid assets, these are the assets pledged as collateral. Since the market price of these illiquid assets can fluctuate, the central bank applies a haircut to their value when determining the amount of the loan. This protects its balance sheet in case there is a default by the borrower that is accompanied by a decrease in the price of the pledged asset. If there is no default, the borrower repays the loan and retrieves its collateral. If there is a default, the collateral is surrendered to the central bank, which will sell it to recover its losses.

The authors analyze the effects of central bank haircuts on several key aspects of the financial system: the amount of liquidity in the system, equilibrium asset prices, the exposure of the central bank's balance sheet, the asset-portfolio decisions of financial institutions and their incentives to default.

The following three channels interact and jointly determine the equilibrium effects of the haircut policy on the economy:

(i) Payments-system liquidity

Changes in the central bank's haircut policy affect the borrowing constraint faced by payments-system participants that need funding. They directly alter the borrowing and payment decisions of the affected FIs and, ultimately, improve or restrict underlying consumption and production in the economy. By lowering the haircut, the central bank reduces the discount on collateral and relaxes the liquidity constraint of FIs that are holding the illiquid asset but need liquidity. This facilitates payment flows and supports economic activity.

(ii) Asset allocation

Changes to the haircut on a specific asset will affect its relative liquidity with respect to other assets. In the model, a lower haircut on the illiquid asset allows its holder relatively easier access to liquidity if needed.[17] This, in turn, affects the portfolio decisions of FIs when they forecast their liquidity needs and, ultimately, affects the prices and allocation of financial assets. A lower haircut will increase the attractiveness of the illiquid asset, which alters the relative prices of the liquid and illiquid assets and induces agents to accumulate more of the illiquid asset. This change in portfolio can be welfare reducing, if the initial holding of liquid and illiquid assets is optimal, or it can be welfare enhancing, if the initial portfolio is not socially optimal and agents are holding too much of the liquid asset.

(iii) Central bank exposure

For a given probability of default by the borrowers, lowering the haircut on a risky asset could increase the exposure of the central bank's balance sheet to possible losses. In addition, a lower haircut could potentially increase the probability of default because it makes the decision to default less costly relative to repaying the loan. Haircuts set too low could therefore give FIs the incentive to default. This increased probability of default affects the central bank's ability to control price stability because of a potential unintended expansion of its balance sheet. In the model, this translates into an expansion of the monetary base that can increase expected inflation, which is costly to society.[18]

Discussion and Conclusion

While the model presented here is stylized, it highlights the essential points that the central bank must consider when determining its haircut policy. First, it stresses the traditional trade-off between the provision of liquidity and the credit, market and liquidity risks. When providing liquidity via collateralized loans, the central bank must consider the implications of restricting the eligibility of assets, as well as the impact of its haircut policy on the exposure of its

17 Since the model deals with only two assets, this change in relative liquidity is between these two assets. In the more realistic case, a change in the haircut on one asset will change its liquidity in relation to that of all other assets.

18 Since the government's fiscal authority is not explicitly modelled, the loss is financed by an inflation tax.

balance sheet to credit risk. Second, the model highlights the potential of the central bank's haircut policy to affect the allocations of asset portfolios, asset prices and borrowers' incentives to default, which, as noted above, can have real welfare consequences.[19]

The model highlights the potential of the central bank's haircut policy to affect the allocations of asset portfolios, asset prices and borrowers' incentives to default

In its day-to-day operations, under normal circumstances, the central bank typically restricts the list of eligible assets accepted in payments systems to high-quality assets with relatively low credit and liquidity risk; it aims for "market-neutrality," whereby its operations do not significantly influence relative asset prices.[20] Under extraordinary circumstances, such as a liquidity-induced crisis, however, it may be reasonable for the central bank to temporarily broaden the collateral pool and accept less-marketable assets in its day-to-day operations, thus freeing more conventional liquid collateral for use in other operations.[21] When the scarcity of liquidity threatens the well-functioning of the financial system (for example, during a period of financial stress), the benefits of providing additional central bank liquidity by reducing haircuts or expanding the list of eligible assets can outweigh the potential costs associated with the distortion of asset portfolios and the higher risk exposure of the central bank's balance sheet. A similar view—that central banks should take the liquidity of the financial system into account when setting haircuts—is found in the report of the Bank for International Settlements' Committee on the Global Financial System (CGFS 2010) on the cyclical behaviour of private sector margins and haircuts.

Policy-makers face the challenge of a growing demand for high-quality collateral

Policy-makers also face the challenge of a growing demand for high-quality collateral. Modern financial systems tend to utilize more collateral because of the increased private use of collateral, and because of the need to post additional collateral with payment and settlement systems.[22] The G-20 countries committed to have all standardized over-the-counter derivatives contracts cleared by central counterparties (CCPs) by the end of 2012 to help strengthen the global financial system. Such an increase in CCP activity has the potential to increase the need for collateral.[23] In addition, revisions to the core principles for financial market infrastructure, currently being considered by the Bank for International Settlements' Committee on Payment and Settlement Systems and by the International Organization of Securities Commissions, will further increase the demand for collateral by financial market participants. The haircuts set by central banks are important parameters in determining the ability of financial systems to make the most efficient use of high-quality collateral.

19 For a discussion on the collateral-management practices of LVTS participants during relatively normal times, see D'Souza (2009).

20 Chailloux, Gray and McCaughrin (2008) provide a comparison of collateral frameworks in different jurisdictions. They discuss the eligibility of assets as collateral and the implications of collateral policy for the market's choice of asset portfolios and for the pricing of credit and liquidity spreads.

21 During the recent financial crisis, the Bank of Canada expanded the list of assets that could be pledged as collateral in LVTS intraday operations and under the SLF, while strengthening its requirements for transparency and credit ratings. Direct participants in the LVTS were able to pledge their non-mortgage loan portfolio (NMLP) to cover the system's collateral requirements, as well as those of the SLF and the Term Loan Facility. As of 1 April 2010, LVTS participants may use their NMLP for up to 20 per cent of their total collateral value. The Bank also conducted term purchase and resale agreements with primary dealers against an expanded set of eligible securities.

22 An example of the increased private use of collateral is the larger size of institutional cash pools, which demand collateral in their day-to-day money market investments (Pozsar 2011).

23 If the settlement of over-the-counter financial transactions moves to CCPs, then the aggregate value of collateral needed may decrease because of efficiency gains in multilateral netting. But if this move decreases the overall amount of netting, then the need for collateral could increase (Duffie and Zhu 2010).

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